

# Beamline 14-ID / BioCARS-CAT

**Scientific focus:** Structural biology

**Scientific programs:** Large unit cell (virus) crystallography, small unit cell (protein) crystallography, MAD phasing, time-resolved crystallography, Laue diffraction, and study of microcrystals

## Optics & Optical Performance

- slits
- power filters
- CARS-design diamond(111) monochromator
  - 28.013 m from source
  - double bounce
  - 6.5–18.5 energy range
  - $<10^{-4}$  energy resolution ( $\Delta E/E$ ) at 10 keV
  - 38 mm offset (fixed-exit, down bounce)
  - water cooled
- CARS design cylindrical focusing mirror
  - 29.870 m from source
  - Si substrate, Rh coating
  - water cooling at midplane
  - 4.1 mrad design angle
  - horizontal focus: sagittal cylindrical figure
  - vertical focus: bender

## Experiment Stations

### 14-ID-A

- white beam first optics enclosure
- 10.5 m x 1.7 m x 2.8 m (L x W x H)

### 14-ID-B

- white, pink, or monochromatic beam station
- 4.5 m x 2.6 m x 2.8 m (L x W x H)
- MAD phasing
- microcrystallography
- virus/protein crystallography
- Laue crystallography
- time-resolved crystallography

## Detectors

- ADSC Q4, MAR345 and off-line image plate detectors

## Beamline Controls and Data Acquisition

- beamline and experiment control:
  - Dell Precision 620/PIII 933
  - Red Hat Linux 7.1
  - EPICS via VME
  - ADSC or Mar control software
- analysis: SGI 02 IRIX 6.5 running HKL/Denzo, DPS/MOSFILM, CCP4, CNS, LaueView, O, Predict, Resolve, Shelx, Strategy, Solve, XtalView, etc.

## Beamline Support Equipment/Facilities

- cryo-coolers: Oxford CryoJet and CARS liquid-nitrogen/liquid-helium cooler
- collimators, filters, slits, beam-stop, CCD alignment cameras
- beam position monitors (1  $\mu$ m resolution)
- beam flux monitors
- BL3 facility, sample-prep areas, cold room
- biochemistry equipment (pH meters, incubator, centrifuge, pipettes, glassware, lab refrigerator, etc.)

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## Insertion Device Source Characteristics (nominal)

source 1	wiggler A
period	8.50 cm
length	2.4 m
peak $K_{\text{max}}$ (at minimum gap = 18.1 mm)	8.74
critical energy (at minimum gap = 18.1 mm)	35.9 keV
energy range (wiggler mode)	5.0 - 200.0 keV
on-axis peak brilliance at 29.9 keV (wiggler mode at minimum gap = 18.1 mm)	$1.1 \times 10^{17}$ ph/sec/mrad <sup>2</sup> /mm <sup>2</sup> /0.1%bw
on-axis peak angular flux at 29.9 keV (wiggler mode at minimum gap = 18.1 mm)	$5.4 \times 10^{15}$ ph/sec/mrad <sup>2</sup> /0.1%bw
source size at critical energy $\Sigma_x$ $\Sigma_y$	359 $\mu\text{m}$ 21 $\mu\text{m}$
source divergence at critical energy $\Sigma_{x'}$ (FWHM 1.2 mrad, non-Gaussian) $\Sigma_{y'}$	510 $\mu\text{rad}$ 47 $\mu\text{rad}$

source 2	Undulator A
period	3.30 cm
length	2.47 m
effective $K_{\text{max}}$ (at minimum gap = 10.5 mm)	2.78
energy range 1st harmonic	2.9 - 13.0 keV
energy range 1st - 5th harmonics	2.9 - 45.0 keV
on-axis peak brilliance at 6.5 keV	$9.6 \times 10^{18}$ ph/sec/mrad <sup>2</sup> /mm <sup>2</sup> /0.1% bw
source size at 8.0 keV $\Sigma_x$ $\Sigma_y$	359 $\mu\text{m}$ 21 $\mu\text{m}$
source divergence at 8.0 keV $\Sigma_{x'}$ $\Sigma_{y'}$	24 $\mu\text{rad}$ 6.9 $\mu\text{rad}$